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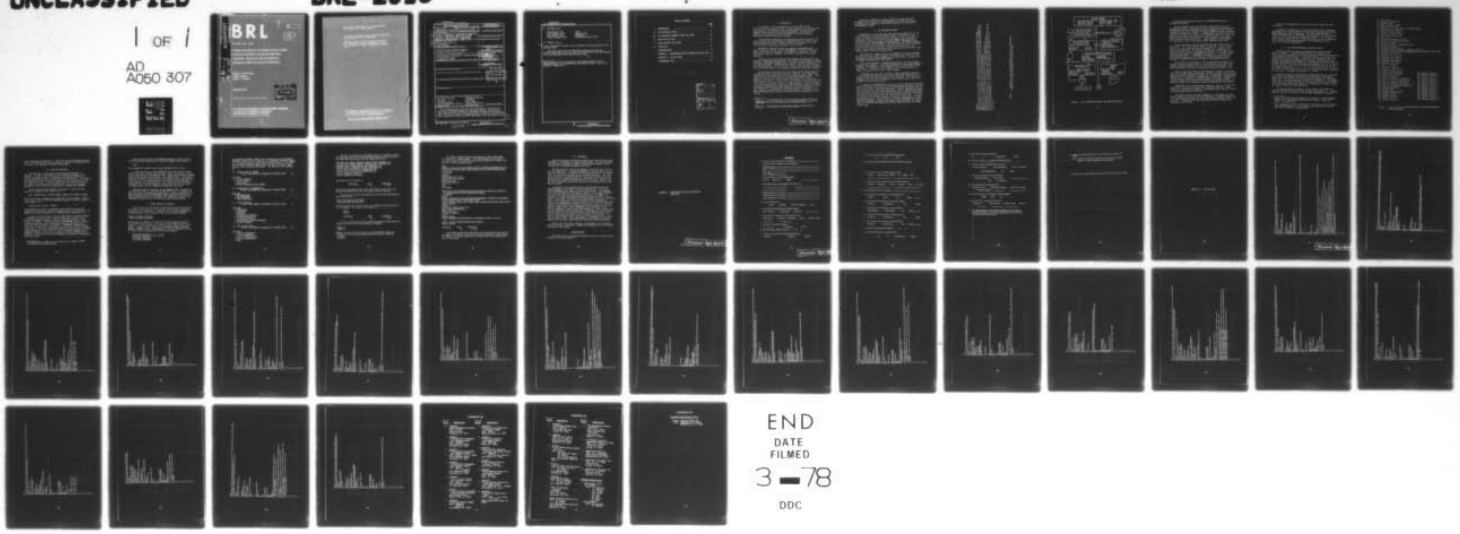

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STORAGE AND RETRIEVAL OF INFORMATION ON SYSTEMS OF PARTIAL DIFFERENTIAL EQUATIONS AND THEIR SOLUTIONS: CREATABASE AND THE CONTINUUM MECHANICS CENTER DATA BASE OF HYDROCODES

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September 1977

USA ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
USA BALLISTIC RESEARCH LABORATORY
ABERDEEN PROVING GROUND, MARYLAND

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Data Base Query

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A Continuum Mechanics Center has been established for the purposes of evaluating and developing models of interacting continua. Because of the large and growing body of literature concerning such models and related computer codes, the vast number of assumptions made in their use, and the varying types of numerical methods utilized in these codes, a data base analysis → next page

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system, CREATABASE,[1] was used to store information and characteristics of the different codes.

This paper briefly describes CREATABASE, delineates the data base, describes queries made on the data base, and outlines future uses and expansion of the data base and the data base analysis system.

[1] Daniel Analytical Services Corporation, "User Reference Manual for the CREATABASE Module of an Integrated Data Base Analysis System: Level U-4A," Houston, TX, August 1976.

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I. INTRODUCTION

The formation of a Continuum Mechanics Center (CMC) at the Ballistic Research Laboratory (BRL) to study, evaluate, and develop large hydrodynamics, solid mechanics, particle transport, and heat transfer computer codes presented an excellent opportunity to simultaneously generate a data base containing information on systems of partial differential equations and their solutions.

A questionnaire (Appendix I) was developed and sent to a number of BRL scientists soliciting information regarding codes of interest. The response furnished data on 20 codes and led to the formation of a data base from which significant information can be derived.

CREATABASE, a commercial data base analysis system marketed by Daniel Analytical Services Corporation (DANALYT) of Houston, Texas, was used to store data for retrieval. CREATABASE is a relational [2,3] data base system, written in FORTRAN, which runs on the UNIVAC 1100 series computers.

Queries are made using English-like statements and may be made in a batch or interactive processing mode. The output for each mode is slightly different. CREATABASE affords little in the way of report generation; that is, formatted output. CREATABASE does, however, offer the user the capability of outputting all or any part of the data on an auxiliary file which the user can then process in any fashion desired, including report formats.

Sixty-two descriptors form the total domain of the current data base. It offers the user an accessible and easily used tool for ascertaining characteristics and capabilities of certain computer codes at BRL. Information such as the code's applications, numerical method, spatial geometry, equation(s) of state and reports dealing with the code and its performance, as well as 32 other items, are included in the data base. However, specific data about solutions of equations such as subroutine names in which various processes occur, the actual equations solved, or anomalies of systems of equations in a particular code do not now constitute a part of the data base. Although this information should be available in a user's manual, a more accessible information source is desirable. As the data base develops such items will be considered as possiblities for inclusion.

---

[2] Codd, E.F., "A Relational Model of Data for Large Shared Data Banks," Communications of the Association for Computing Machinery, 13, No. 6, June 1970.

[3] Date, C.J., An Introduction to Data Base Systems, Addison-Wesley, NY, 1976.

Adding new information on codes already in the data base and cataloging other codes are a continuing part of the CMC's activities. In addition, new commands to allow easier querying are being added to the CREATABASE system.

II. THE CREATABASE SYSTEM

CREATABASE is a relational data base analysis system; that is, all of the data which forms the data base exists in tabular form. The columns are formally called descriptors (domains or sets in relational terms) and contain all of the states which comprise that descriptor. For example, a descriptor might be MAXIMUM SPATIAL DIMENSIONALITY and contain as states ONE DIMENSIONAL, TWO DIMENSIONAL, AND THREE DIMENSIONAL. Rows are formally called records (n-tuples or relations) and are formed by selecting one of the possible states from each descriptor. See Figure 1 as an example of an input record (note that two successive commas indicate there is no data for that entry).

CREATABASE is a compiler, written in FORTRAN, that takes statements written in an English-like language, interprets them and executes them. The program is very compact requiring only 21,000 words of storage, yet is modular consisting of 42 subroutines.

There are 56 commands in CREATABASE which fall into seven command categories (see Figure 2). Since an explanation for each command appears elsewhere (see Reference 1) the commands will not be discussed in great detail here. It should be noted, however, that a data base can be created and queried with as few as four commands.

CREATABASE does not have an extensive report generation capability. It does indicate how many hits or matches have occurred and what percentage of the data base the number of hits represent. This statistical information can be used for designing further queries and to check the validity of the data base itself.

In addition, CREATABASE does allow any or all of the data in the data base to be output onto a file for further processing during that execution or at a later time. This selective retrieval of data for future use is a most useful tool for scientific processing. Several independent programs exist to assist the user in reformatting data for his special applications. The user then has great control over the subsequent handling of his data in addition to the capabilities provided by the system itself. The user may interface his data with graphics, simulation, statistical, or reports generation packages. The user may also interface CREATABASE with other data base management packages, for example, using CREATABASE for the purpose of collecting and refining data and the other packages for elegant output forms.

```
BLAST,
UNSTEADY/2D/EULERIAN/SINGLE MATERIAL/FINITE DIFFERENCE/COMPRESSIBLE FLUID,
CALCULATION OF MUZZLE BLAST FLOW FIELDS/TR-4155 PICATINNY ARSENAL /AD881523/DEC
1970,T D TAYLOR,1,BRLESC,1,MUZZLE BLAST CALCULATIONS,JET FLOW CALCULATIONS,,1,1,
GODUNOV,1,2,2,1,CONSERVATION OF MASS/MOMENTUM/ENERGY,
DENSITY/DENSITY TIMES VELOCITIES/DENSITY TIMES TOTAL ENERGY,2,,,,
REFLECTIVE/FREE-SLIP,70 BY 70,4,1,2,3,1,2,1,1,3,NOT APPLICABLE,3,3,2,,,
C K ZOLTANI,1,EVALUATION OF THE COMPUTER CODE BLAST DORF HELP AND HEMP FOR SUITA
BILITY OF UNDEREXPANDED JET FLOW CALCULATION BRL1659,C K ZOLTANI,,,,,,,,,
,,,,,,,,,*
```

Figure 1. An Example of One Input CREATABASE Record for the Hydrocode BLAST in the Continuum Mechanics Center Data Base

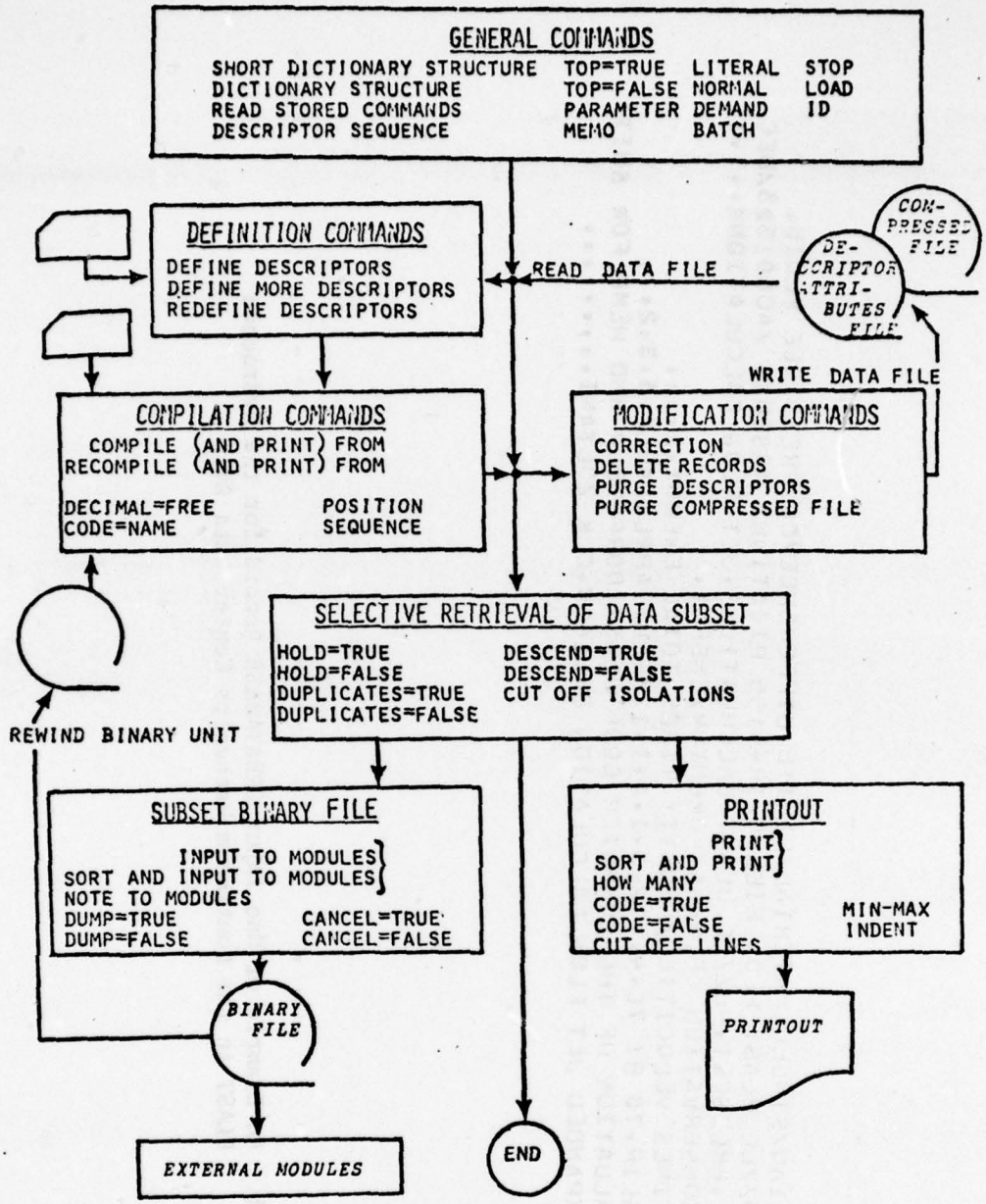

Figure 2. The CREATABASE Commands and Command Categories

The following describes briefly how a CREATABASE data base is assembled and queried.

The user determines his own descriptor names which may be up to 126 characters long. Descriptors are used to represent both numeric and alphanumeric data but a descriptor may only represent one type of data. A numeric descriptor may represent a range of numbers and carry additional identifying information (a label). An alphanumeric descriptor may be in either of two forms; it may represent a series of states all of which are predetermined (coded descriptors), or it may represent an open ended series of states (name descriptors). Coded descriptors are preferable for alphanumeric data as they require fewer computer storage cells.

Once the descriptors have been defined, data are input using one of three forms. The first and most common is card input. Input in this fashion is in free format and may be accomplished in a batch or interactive processing mode. The second input mode uses a formatted file whereby the user indicates the number of characters in the input string. The third input mode uses a CREATABASE file which is in a highly coded, densely packed format. A CREATABASE file generally is used when the user wishes to operate on a subfile which he has previously created (output) on another execution, or earlier in the current execution.

Once the data has been input it may be examined using general and printout commands shown in Figure 2. If there are errors, these may be corrected using the modification or subset binary file commands. One might correct the data base by reentering the entire data base as well.

After the data are corrected, the data base is ready to be queried. Queries are accomplished using general, selective retrieval, subset binary file, and printout commands (see Figure 2). At the heart of the querying commands are the two printout commands PRINT and HOW MANY. Commands from the other query categories allow manipulations of the data so that the specific queries may be answered by the PRINT and HOW MANY commands. In addition, output may be generated using the subset binary file commands.

CREATABASE has full Boolean logic capability ("and", "or" and "not") which can be used with the modification, selective retrieval, subset binary file, and printout commands. Using Boolean logic one may retrieve any datum contained in the data base.

The general form of the output commands is a descriptor list (the desired output) followed by a Boolean expression. A Boolean expression is a concatenation of quantifiers using the Boolean operators "and", "or" and "not". A quantifier has the form descriptor name, followed by a *descriptor value (state).*

Samples of CREATABASE queries and the resulting output are shown in Section V.

In addition to Reference 1, an annotated guide[4] and two samples of CREATABASE runs[5] are most helpful for using and understanding the CREATABASE commands and their interactions. The cited references, while forming a complete set of CREATABASE system documents, are terse and make the use of the system seem more complicated than it is. Of course, quite complex interactions can be obtained through the use of CREATABASE and the UNIVAC EXEC 8 operating system. Such interactions, while noted, will not be discussed here.

III. THE CONTINUUM MECHANICS CENTER DATA BASE

Data for the CMC data base was gathered using the questionnaire shown in Appendix I. Questionnaires were sent to a number of BRL scientists who supplied data which were then used to define the descriptors (state names) for the data base. Sixty-two descriptors (see Figure 3) were used to describe the data. The data base was designed so that each record of data provided information for one code. The descriptors are divided into several broad categories: those dealing with (i) the type of problems treated by the code; for example, descriptors 8, 9, 10, 15, 16, 17, 18, 24, 28, 29, 31, 32, 34, 36, 37, (ii) the characteristics of the code; for example, descriptors 1, 2, 5, 6, 7, 11, 12, 13, 14, 19, 20, 21, 22, 23, 25, 26, 27, 30, 33, 35, 38, 39, 40, and (iii) people and reports connected with the code; for example, descriptors, 3, 4, 41-62.

Queries are often initially made on certain descriptors to determine which code(s) can perform a desired type of calculation. Subsequent queries can then be made to obtain more detailed information concerning these codes. (For an example set of queries, see Section V). Furthermore, other data bases can be generated from the current data base; for example, if the data base becomes very large, one consisting only of reports dealing with the codes may become desirable.

The data base which is stored in 35,000 words on the UNIVAC 1108 computer currently contains data for 20 codes (see Appendix II). Although there are now only 20 records in the data base significant information

---

[4] Daniel Analytical Services Corporation, ""Primer" for "The CREATABASE Module" of An Integrated Data Base Analysis System: Level U-4A," Houston, TX, August 1976.

[5] Daniel Analytical Services Corporation, "An Illustrative Check Deck for "The CREATABASE Module" of An Integrated Data Base Analysis System: Level U-4A," Houston, TX, August 1976.

1. CODE NAME
2. GENERAL DESCRIPTION
3. USERS MANUAL
4. USERS MANUAL AUTHOR
5. COMPUTER LANGUAGE
6. COMPUTERS ON WHICH CODE IS OPERATIONAL
7. DEVELOPMENTAL STATUS
8. PRIMARY APPLICATION
9. SECONDARY APPLICATION
10. TERTIARY APPLICATION
11. MESH TYPE
12. GENERAL NUMERICAL METHOD
13. PARTICULAR NUMERICAL METHOD
14. ORDER OF SCHEME
15. MAXIMUM SPATIAL DIMENSIONALITY
16. SPATIAL GEOMETRY
17. UNSTEADY CALCULATION
18. CONSERVATION/TRANSPORT EQUATIONS SOLVED
19. VARIABLES COMPUTED FROM CONSERVATION/TRANSPORT EQUATIONS
20. EQUATION OF STATE 1
21. EQUATION OF STATE 2
22. EQUATION OF STATE 3
23. EQUATION OF STATE 4
24. BOUNDARY CONDITIONS
25. MAXIMUM GRID SIZE
26. TYPE OF REZONING
27. EXPANDING GRID
28. MATERIAL RESPONSE
29. ELASTIC PLASTIC SOLID
30. NUMBER OF MATERIALS
31. INTERFACE CAPABILITY
32. TYPE OF FLUID FLOW
33. SHOCK TREATMENT
34. TYPE OF RADIATION TRANSPORT
35. TYPE OF ENERGY DEPOSITION
36. TYPE OF CHEMICAL REACTIONS
37. TYPE OF ATOMIC REACTIONS
38. EXTENT OF GRAPHICS CAPABILITY
39. SPECIAL FEATURES
40. LIMITATIONS
41. KNOWLEDGEABLE USERS
42. NUMBER OF REPORTS
43. REPORT TITLE 1
44. REPORT AUTHORS 1
45. REPORT TITLE 2
46. REPORT AUTHORS 2
47. REPORT TITLE 3
48. REPORT AUTHORS 3
49. REPORT TITLE 4
50. REPORT AUTHORS 4
51. REPORT TITLE 5
52. REPORT AUTHORS 5
53. REPORT TITLE 6
54. REPORT AUTHORS 6
55. REPORT TITLE 7
56. REPORT AUTHORS 7
57. REPORT TITLE 8
58. REPORT AUTHORS 8
59. REPORT TITLE 9
60. REPORT AUTHORS 9
61. REPORT TITLE 10
62. REPORT AUTHORS 10

Figure 3. The Sixty-Two Descriptors Used for the Continuum Mechanics Center Data Base

can be extracted (see Section V). Future plans include expanding the data base to include more codes and more reports. However, this data base will not become a bibliography for different hydrocodes.

IV. USING THE DATA BASE

The data base is operational on the UNIVAC 1108 computer at Edgewood. As such, it runs under the EXEC 8 operating system. This section will provide the user the means to sign onto the computer, invoke the CREATABASE system, and gain access to the data base. It is highly recommended that users copy the data base files onto their own files before using the system. If this is impractical, the user must not invoke any commands which would modify the data base; that is, the user must not use any of the definition, modification, or compilation commands.

The following describes BATCH mode operation. To sign onto the computer the command in card column 1 is:

```
@RUN  IDENTIFICATION, ACCOUNT NUMBER, CMCLIB, TIME, PAGES OF OUTPUT.
```

The user must make arrangements for obtaining an account number. CMCLIB is the project name for the CMC CREATABASE data base. The next instruction (card column 1) is:

```
@MISD*CAB.CAB  CMDIC1.D, CMCMP1.C                    .          *
```

The MISD*CAB.CAB invokes the CREATABASE system; CMDIC1.D is the file containing the descriptor attributes (logical unit 9; see Reference 1) and CMCMP1.C is the file containing the compressed data (logical unit 12).

At this time control passes from the UNIVAC EXEC 8 operating system to CREATABASE. You are ready to query the data base using any of the permissible command categories: general, selective retrieval, subset binary, or printout. A familiarity with the CREATABASE system is helpful to minimize the time spent in designing queries and auxiliary output (using the subset binary file operations). CREATABASE commands are free form; that is, there are no card column restrictions as to where commands can be placed. The normal CREATABASE separator is the comma and the normal command terminator is the asterisk. Not all CREATABASE commands need a terminator; however, the user is unburdened by using a terminator on all commands. The user has the option of changing the separator and terminator if he so desires.

* If files CMDIC1 or CMCMP1 are not available do an @ASG,A filename for either or both missing files.

When one has finished his CREATABASE operations, control is given back to the UNIVAC system with the following command (card column 1):

```
@FIN
```

This command will provide time and cost information to the user.

If the user wishes to query CREATABASE using the interactive mode, several additional commands are necessary. First, the user must dial up and be given access to the computer. Next, before using the RUN statement, the user must identify himself using a site identification. Site identifications are easily obtained and are well marked on hard wired terminals. After the site ID has been entered and the computer has acknowledged it, the procedure is as described above. At the conclusion of the terminal execution, after the @FIN command has been issued, the user must issue an @@TERM and wait for the terminal or modem light to go out.

Additional aids for the user are the commands CNTRL Z to erase the last character typed if a mistake was made and @@X TIO to interrupt output when a query is producing too much output. Greater knowledge of the EXEC 8 operating system and CREATABASE only enhances the skill of the user and enables him to do more complicated operations. However, the information presented here is sufficient to query the data base.

V. SAMPLE QUERIES AND OUTPUTS

This section will show several typical queries and the instructions used prior to the queries so that the user has the proper information for querying at his disposal. A complete list of the 62 descriptors in the CMC data base can be obtained by using the following command:

```
>SHORT DICTIONARY STRUCTURE*
 SHORT DICTIONARY STRUCTURE*
```

Notice that the command is echoed back to the user which accounts for the repeated line of output. The output of this command is given in Figure 3. The individual states of any descriptor can easily be determined; for example, the states of the descriptors GENERAL NUMERICAL METHOD, MAXIMUM SPATIAL DIMENSIONALITY, SPATIAL GEOMETRY and TYPE OF FLUID FLOW, are obtained by the following command:

```
>DESCRIPTOR SEQUENCE 12, 15, 16, 32*
 DESCRIPTOR SEQUENCE 12, 15, 16, 32*
>DICTIONARY STRUCTURE*
 DICTIONARY STRUCTURE*
```

The DESCRIPTOR SEQUENCE command used in conjunction with DICTIONARY STRUCTURE command restricts output of the DICTIONARY STRUCTURE command to just those descriptors whose sequence numbers appear in the former. The DICTIONARY STRUCTURE COMMAND prints the name and complete specification of the requested descriptors. The output of these commands is:

```
12.  GENERAL NUMERICAL METHOD
          OPTION  CODE NUMBER OF CHARACTERS IN LONGEST STATE     32

CODE NAME
   1 FINITE DIFFERENCE
   2 FINITE ELEMENT
   3 MONTE CARLO
   4 FINITE DIFFERENCE/FINITE ELEMENT

15.  MAXIMUM SPATIAL DIMENSIONALITY
          OPTION  CODE NUMBER OF CHARACTERS IN LONGEST STATE     17

CODE NAME
   1 ONE DIMENSIONAL
   2 TWO DIMENSIONAL
   3 THREE DIMENSIONAL

16.  SPATIAL GEOMETRY
          OPTION  CODE NUMBER OF CHARACTERS IN LONGEST STATE     33

CODE NAME
   1 RECTANGULAR
   2 CYLINDRICAL
   3 SPHERICAL
   4 RECTANGULAR/CYLINDRICAL
   5 RECTANGULAR/SPHERICAL
   6 CYLINDRICAL/SPHERICAL
   7 RECTANGULAR/CYLINDRICAL/SPHERICAL
   8 SPECIAL TREATMENT

32.  TYPE OF FLUID FLOW
          OPTION  CODE NUMBER OF CHARACTERS IN LONGEST STATE     23

CODE NAME
   1 INVISCID COMPRESSIBLE
   2 VISCID COMPRESSIBLE
   3 INVISCID INCOMPRESSIBLE
   4 VISCID INCOMPRESSIBLE
   5 NONE
```

The user can now make an intelligent query as to number of codes in the data base which use a finite difference method and which calculate two dimensional cylindrical inviscid compressible flows.

```
>HOW MANY HAVE GENERAL NUMERICAL METHOD,FINITE DIFFERENCE AND
 HOW MANY HAVE GENERAL NUMERICAL METHOD,FINITE DIFFERENCE AND
>MAXIMUM SPATIAL DIMENSIONALITY,TWO DIMENSIONAL AND
 MAXIMUM SPATIAL DIMENSIONALITY,TWO DIMENSIONAL AND
>TYPE OF FLUID FLOW,INVISCID COMPRESSIBLE AND
 TYPE OF FLUID FLOW,INVISCID COMPRESSIBLE AND
>SPATIAL GEOMETRY,CYLINDRICAL*
 SPATIAL GEOMETRY,CYLINDRICAL*
```

The response for this query is:

ISOLATIONS	TOTAL	PERCENTAGE
2	20	10.00

Notice that the number of hits, the total number of data base items and the percentage of hits to total items is always displayed.

Now wishing to see the code names for the two codes satisfying the above query we ask:

```
>PRINT CODE NAME FOR WITH HOLD*
 PRINT CODE NAME FOR WITH HOLD*
```

The HOLD instruction is used so that the long Boolean expression need not be repeated. The result of this query is:

```
BLAST
LASXPT

ISOLATIONS                    TOTAL              PERCENTAGE
         2                       20                   10.00
```

Finally, wishing to see more information about the codes BLAST and LASXPT, we issue the following sequence of commands:

```
>INDENT 0*
 INDENT 0*

>PRINT 1,2,3,4,5,7,8,20,24,25,34,41,42,43,44 FOR WITH 1,BLAST OR
 PRINT 1,2,3,4,5,7,8,20,24,25,34,41,42,43,44 FOR WITH 1,BLAST OR
>1,LASXPT*
 1,LASXPT*
```

The INDENT 0 command instructs the system to indent zero spaces (no indentation) between outputs. The PRINT command illustrates that the numeric value of a descriptor may be used in place of its name. The results of these instructions are:

```
BLAST
UNSTEADY/2D/EULERIAN/SINGLE MATERIAL/FINITE DIFFERENCE/COMPRESSIBLE FLUID
CALCULATION OF MUZZLE BLAST FLOW FIELDS/TP-4155 PICATINNY ARSENAL/AD881
523/DEC 1970
T D TAYLOR
FORTRAN
OPERATIONAL/EASY TO RUN
MUZZLE BLAST CALCULATIONS
PERFECT GAS LAW
REFLECTIVE/FREE-SLIP
70 by 70
NONE
C K ZOLTANI
  1
EVALUATION OF THE COMPUTER CODE BLAST DORF HELP AND HEMP FOR SUITABILITY
  OF UNDEREXPANDED JET FLOW CALCULATION  BRL1659
C K ZOLTANI
LASXPT
NONEQUILIBRIUM/RADIATION-HYDRODYNAMICS/ATMOSPHERIC TRANSPORT AND RESPONSE/
PLASMA CHEMISTRY/LASER PLASMA/LASER TARGET
THE BRL NONEQUILIBRIUM LASER PLASMA-TARGET INTERACTION CODE/BRL DRAFT REPORT
JOSEPH LACETERA
FORTRAN
OPERATIONAL/COMPLICATED TO RUN
LASER PLASMA INTERACTIONS
PERFECT GAS LAW
TRANSMITTIVE/MOVING
50 BY 5
NONEQUILIBRIUM
JOSEPH LACETERA/CONTINUUM MECHANICS CENTER/BRL/APG MD/301 278 4353
  2
LASXPT 1 PLASMA INTERACTIONS/BRL DRAFT REPORT
JOSEPH LACETERA

ISOLATIONS        TOTAL        PERCENTAGE .
         2           20             10.00
```

These examples have been constructed as an illustrative group and are not meant to be complete or portray all of the capabilities of the system. For example, the reverse numerical and alphabetical sorting capabilities have not been shown.

VI. DISCUSSION

This report deals with the CMC's computer code data base which uses CREATABASE, a relational data base analysis system. Besides describing the data base, the manner in which it is accessed and queried is also explained and corresponding examples are given.

CMC personnel are not only the designers of the data base but also are its primary users. Care and maintenance of the data base is one of the CMC's functions. In addition to ensuring correctness of the current data, the center will add new data as it becomes available. Such data is not limited to that defined by the current 62 descriptors since new descriptors will be added as required. No attempt will be made to make the data base a complete reference system for all codes. However, the CMC will consider and catalog not only the most promising, but also the most used codes.

In addition to the data base itself, the CREATABASE system must undergo change and not remain a static inflexible tool. One area in which CREATABASE can be improved is that of subtabling. The amalgamation of like descriptors (for example, authors) into a single descriptor will allow for easier querying and new relations to be formed. For instance, the output of a query involving an author may produce his co-authors for a single reference or all his co-authors for all his published works. Furthermore, short queries involving a single amalgamated descriptor are preferable to long descriptor lists or Boolean expressions. Finally, the amalgamated descriptor will alleviate some of the need for handling subset binary files through the fortuitous production of information. Another area in which CREATABASE can be improved involves limited alphanumeric searching for name descriptors. Such a change would not only extend the textual capabilities of CREATABASE but free the user from entering artificial data for several types of applications and/or exactly specifying a descriptor state in the Boolean expression. The form for this extension should also provide for a range of values rather than a specific state. Other improvements of CREATABASE are possible; however, the two items listed above will make this system even better.

Finally, the use of this data base is encouraged as an information retrieval system. Furthermore, comments and suggestions on its structure and contents are welcome.

ACKNOWLEDGEMENT

The authors wish to thank Daniel Analytical Services Corporation for permission to publish Figure 2.

APPENDIX I. QUESTIONNAIRE USED TO GATHER DATA BASE DATA

QUESTIONNAIRE

1. The name of the code (acronym plus its meaning) is _____.

2. List the following information on the user's manual:

   Author(s)_____

   Address of Authors_____

   Title _____

   Report Number_____

   Date of Publication _____.

3. Code is operational on the following computers:

   CDC 7600 UNIVAC 1108 BRLESC _____.

4. The following people are knowledgeable in the code's use:

   _____ _____

   _____ _____.

5. Primary application of the code is _____.

   Second application of the code is _____.

   Tertiary application of the code is _____.

6. The type of mesh used is

   Eulerian Lagrangian Eulerian & Lagrangian unknown.

7. The code uses the following general numerical method:

   finite difference finite element Monte Carlo _____.

8. The code uses the following particular numerical method:

   characteristics Lax-Wendroff random walk Galerkin multipass integral

   _____ _____.

9. The order of the numerical scheme is

   _____ not applicable . unknown.

10. The code performs unsteady calculation: yes no.

11. The code can treat the following spatial geometry(ies):

    rectangular cylindrical spherical.

12. The code can treat the following spatial dimensionality:

one two three.

13. List the variables computed directly from the transport equations.

14. The code can use the following equations of state:

Tillotson perfect gas law BRLGRAY JWL CHARTD PUFF

_____ _____.

15. The code can apply the following types of boundary conditions:

reflective transmittive non-slip free-slip moving free surface

_____ _____.

16. The maximum grid size for the code is _____ by _____.

17. The code has the following type of rezoning capability:

automatic manual none unknown _____.

18. The code does the following type of radiation transport

equilibrium non-equilibrium none unknown.

19. The code does the following type of energy deposition:

time-independent time-dependent none unknown _____.

20. The code does the following type of chemical reactions:

equilibrium non-equilibrium none unknown.

21. The code does the following type of atomic reactions:

equilibrium non-equilibrium none unknown _____.

22. The code calculates material response: yes no.

23. The code treats solids as an elastic plastic:

yes no not applicable unknown .

24. The code has an interface capability:

yes no not applicable unknown.

25. The code can handle _____(number of) different materials.

26. The code treats the following types of fluid flow:

inviscid compressible viscous compressible inviscid incompressible

viscous incompressible none unknown.

27. The code treats shocks by the following method:

artificial viscosity shock fitting _____

none not applicable.

28. The code solves the following equations:

conservation of mass conservation of momentum conservation of energy

Boltzmann's equation _____ _____.

29. The code is written in the following computer language(s):

FORTRAN ALGOL APL .

30. The code has the following special features:

strength option tracer particles combustion option sliplines

_____ _____ _____.

31. The following reports contain information relating to the code itself or the code's performance. For such reports give author(s), report number(s), and title(s) or key words. The total description per report should be less than 120 characters including blanks.

1.

2.

3.

4.

5.

6.

7.

8.

9.

32. Describe the salient features of the code in less than 120 characters; for example,

HELP: unsteady, 2D, Eulerian, multi-material, finite difference, integral formulation, solid and compressible fluid applications.

33. Please list any pertinent computer code properties omitted and any other comments.

APPENDIX II. THE DATA BASE

PETROS 3.5
FINITE DIFFERENCE/LARGE ELASTIC-PLASTIC TRANSIENT DEFORMATIONS OF MULTILAYER VARIABLE-THICKNESS KIRCHOFF SHELLS
PETROS 3.5 NEW DEVELOPMENTS AND PROGRAM MANUAL FOR.../BRL-CR-211/FEB 75
S D PIROTIN/B A BERG/E A WITMER
FORTRAN
BRLESC
OPERATIONAL/EASY TO RUN
TRANSIENT DEFORMATION OF SHELLS

LAGRANGIAN
FINITE DIFFERENCE
EXPLICIT
SECOND
THREE DIMENSIONAL
SPECIAL TREATMENT
YES
CONSERVATION OF MASS/MOMENTUM/ENERGY
ENERGY/DISPLACEMENT/STRAIN

CLAMPED/HINGED/FREE/CYCLIC/SYMMETRY/SHELL IN PLANE STRAIN/AXISYMMETRIC/POLE/SLIDING CLAMPED/PRESCRIBED TRACTION OR DISPL
23 BY 37

NONE

YES
YES
4
YES
NONE
NOT APPLICABLE
NONE
3
NONE
NONE
EXTENSIVE
MECHANICAL LOADS/THERMAL LOADS/TEMPERATURE DEPENDENT/MULTIMATERIAL SHELLS/INITIAL VELOCITY DISTRIBUTIONS

H L WISNIEWSKI/J M SANTIAGO/J D WORTMAN/N J HUFFINGTON JR
5
COUPLING OF XRAY DEPOSITION TO STRUCTURAL RESPONSE/BRL-IMR-474/FEB 76
H L WISNIEWSKI
MACROSCOPIC FAILURE CRITERIA FOR ABM SUBSTRUCTURE OF BERYLLIUM/BRL-MR-2596/FEB 76
C T CANDLAND
CONTAINMENT STRUCTURES VS SUPPRESSIVE STRUCTURES/BRL-MR-2597/FEB 76
N J HUFFINGTON JR/S R ROBERTSON
SURVIVABILITY ANALYSIS FOR UNSYMMETRICAL ABM CONFIGURATION/BRL-MR-2461/MAR 75
N J HUFFINGTON JR/J M SANTIAGO/N J SCHUMAN/H L WISNIEWSKI
COMPARISON OF FINITE DEFORMATION SHELL CODES REPSIL AND PETROS 3/BRL-MR-2391/JUN 74
S R ROBERTSON
FINITE DIFFERENCE ANALYSIS FOR PREDICTING LARGE ELASTIC-PLASTIC TRANSIENT DEFORMATIONS OF VARIABLE THICKNESS KIRCHOFF....
S D PIROTIN/MORINO/WITMER/LEECH


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FEMAIN
FINITE ELEMENT METHOD APPLIED TO SYSTEMS OF FIRST ORDER HYPERBOLIC EQS USING LEAST SQUARES FORMULATION  INVISCID FLOWS
A FINITE ELEMENT METHOD FOR HYPERBOLIC SYSTEMS OF EQNS IN TWO SPATIAL DIMENSIONS AND TIME APPLIED TO UNSTEADY GAS FLOW
J A SCHMITT
FORTRAN
BRLESC
PILOT
UNSTEADY INVISCID GAS FLOWS
---
---
EULERIAN
FINITE ELEMENT
ELEMENTWISE LEAST SQUARES MINIMIZATION OF RESIDUAL ERROR
FIRST
TWO DIMENSIONAL
RECTANGULAR/CYLINDRICAL
YES
CONSERVATION OF MASS/MOMENTUM/ENERGY
PRESSURE/VELOCITIES/INTERNAL ENERGY
NOBLE-AREL
PERFECT GAS LAW
---
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---
2000 NODES
NONE
NO
NO
NO
  1
NOT APPLICABLE
INVISCID COMPRESSIBLE
NONE
NONE
NOT APPLICABLE
NONE
NONE
NONE
LIMITED GRAPHICS PACKAGE AVAILABLE/TREATS HYPERBOLIC EQS DIRECTLY BY FINITE ELEMENTS
OSCILLATIONS AT SHOCK FRONTS/NO BOUNDARY CONDITIONS EXPLICTLY TREATED
J A SCHMITT
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_ASXPT
NONEQUILIBRIUM/RADIATION-HYDRODYNAMICS/ATMOSPHERIC TRANSPORT AND RESPONSE/PLASMA CHEMISTRY/LASER PLASMA/LASER TARGET
THE BRL NONEQUILIBRIUM LASER PLASMA-TARGET INTERACTION CODE/BRL DRAFT REPORT
JOSEPH LACETERA
FORTRAN
CDC 7600 HUNTSVILLE
OPERATIONAL/COMPLICATED TO RUN
_ASER PLASMA INTERACTIONS
LASER TARGET INTERACTIONS
X-RAY LASER TRANSPORT
EULERIAN
FINITE DIFFERENCE
VARIATION OF PIC
FIRST
TWO DIMENSIONAL
CYLINDRICAL
YES
CONSERVATION OF MASS/MOMENTUM/ENERGY/PARTICLES
DENSITIES/VELOCITIES/GAS ENERGY/RADIATION ENERGY
PERFECT GAS LAW
BRLGRAY
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TRANSMITTIVE/MOVING
50 BY 5
MOVE
YES
YES
NOT APPLICABLE
  2
YES
INVISCID COMPRESSIBLE
SPECIAL TREATMENT
NONEQUILIBRIUM
TIME-DEPENDENT PHOTON ENERGY DEPOSITION
NONEQUILIBRIUM
NONEQUILIBRIUM
_IMITED
NONEQUILIBRIUM IONIZATION/NON-LTE
NOT ROUTINELY RUN
JOSEPH LACETERA/CONTINUUM MECHANICS CENTER/BRL/APG MD/301 278 4353
  2
LASXPT I PLASMA INTERACTIONS/BRL DRAFT REPORT
JOSEPH LACETERA
LASXPT II TARGET INTERACTIONS/BRL DRAFT REPORT
JOSEPH LACETERA
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4CHI
3D HEAT TRANSFER/HEAT CONDUCTION/HEAT DIFFUSION/MONTE CARLO/GREENS FUNCTIONS/HOMOGENEOUS BC/INHOMOGENEOUS BC
SOLUTION OF THE TIME-DEPENDENT HEAT CONDUCTION EQUATION IN COMPLEX GEOMETRY BY THE MONTE CARLO METHOD
E TROUBETZKOY/M KALOS/H STEINBERG//BRLCR-325/DEC 1976
FORTRAN
CDC 7600 HUNTSVILLE
OPERATIONAL/EASY TO RUN
HEAT TRANSFER
---
---
EULERIAN
MONTE CARLO
RANDOM WALK
---
THREE DIMENSIONAL
RECTANGULAR/CYLINDRICAL/SPHERICAL
YES
HEAT CONDUCTION
TEMPERATURE
---
---
---
---
REFLECTIVE/TRANSMITTIVE/FREE SURFACE
---
SPECIAL
NOT APPLICABLE
NO
NO
100
YES
NONE
NOT APPLICABLE
NONEQUILIBRIUM
TIME-DEPENDENT
NONE
NONE
---
TRANSLATIONALLY REPETITIVE ARRAYS
---
J J KLEM/M E BANKS
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RECRIF
UNSTEADY/1D/EULERIAN/COMPRESSIBLE VISCOUS TUBE FLOW/METHOD OF CHARACTERISTICS/NOISE/THRUST/HEAT LOSS/INTERIOR BALLISTIC
RECRIF USERS MANUAL BRL MR 2693  OCTOBER 1976
A < CELMINS
FORTRAN
BRLESC
OPERATIONAL/EASY TO RUN
INTERIOR BALLISTICS OF RECOILLESS WEAPONS
INTERIOR BALLISTICS OF CLOSED BREACH WEAPONS
---
EULERIAN
FINITE DIFFERENCE
CHARACTERISTICS
FIRST
ONE DIMENSIONAL
SPECIAL TREATMENT
YES
CONSERVATION OF MASS/MOMENTUM/ENERGY
IN BARREL-VELOCITY/PRESSURE/DENSITY//IN COMBUSTION CHAMBER-INTERNAL ENERGY/MASS/VOLUME
PERFECT GAS LAW
---
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---
MOVING/TUBE EXIT FLOW
5000 NODES/200 CHARACTERISTICS
SPECIAL
---
NO
NOT APPLICABLE
  1
NOT APPLICABLE
VISCID COMPRESSIBLE
NONE
NONE
NOT APPLICABLE
EQUILIBRIUM
NONE
EXTENSIVE
THRUST CALC/NOISE CALC/HEAT LOSS ESTIMATES/EMPTYING OF WEAPON/ARBITRARY BURNING RATE FTN AND PROPELLANT GEOM
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1 < CELMINS
  1
THEORETICAL BASIS OF THE RECOILLESS RIFLE INTERIOR BALLISTICS CODE RECRIF  BRL 1931 SEPT 1976
A < CELMINS
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BLAST
UNSTEADY/2D/EULERIAN/SINGLE MATERIAL/FINITE DIFFERENCE/COMPRESSIBLE FLUID
CALCULATION OF MUZZLE BLAST FLOW FIELDS/TR-4155 PICATINNY ARSENAL /AD881523/DEC 1970
T D TAYLOR
FORTRAN
BRLESC
OPERATIONAL/EASY TO RUN
MUZZLE BLAST CALCULATIONS
JET FLOW CALCULATIONS

EULERIAN
FINITE DIFFERENCE
GODUNOV
FIRST
TWO-DIMENSIONAL
CYLINDRICAL
YES
CONSERVATION OF MASS/MOMENTUM/ENERGY
DENSITY/DENSITY TIMES VELOCITIES/DENSITY TIMES TOTAL ENERGY
PERFECT GAS LAW

REFLECTIVE/FREE-SLIP
70 BY 70
NONE
YES
NO
NOT APPLICABLE
1
NO
INVISCID COMPRESSIBLE
ARTIFICIAL VISCOSITY
NONE
NOT APPLICABLE
NONE
NONE
LIMITED

C K ZOLTANI
1
EVALUATION OF THE COMPUTER CODE BLAST DORF HELP AND HEMP FOR SUITABILITY OF UNDEREXPANDED JET FLOW CALCULATION BRL1659
C K ZOLTANI


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NASTRAN
STRUCTURES/FINITE ELEMENT/NORMAL MODE/FREQUENCIES/TRANSIENT-ELASTIC/STATIC-PIECEWISE LINEAR/HEAT FLOW
THE NASTRAN USERS MANUAL/LEVEL 15/SCIENTIFIC AND TECHNICAL OFFICE/NASA/WASH DC
EDITOR/C W MCCORMICK
FORTRAN
UNIVAC 1108 EDGEWOOD
OPERATIONAL/EASY TO RUN
STRUCTURAL ANALYSIS
EIGENVALUE EXTRACTION
HEAT FLOW
LAGRANGIAN
FINITE ELEMENT
EXPLICIT TIME DIFFERENCE/NEWMARK BETA
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THREE DIMENSIONAL
RECTANGULAR/CYLINDRICAL/SPHERICAL
YES
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---
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---
---
---
FIXED/SIMPLE SUPPORTS/SYMMETRY/FREE/SPRING
---
NONE
---
YES
YES
---
NOT APPLICABLE
NONE
NOT APPLICABLE
NONE
---
NONE
NONE
---
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A D ALLISON/E QUIGLEY/T ERLINE/V D MAKI
  A
THE NASTRAN PROGRAMMERS MANUAL/LEVEL 15.5/NASA SP-223(01)/MAY 1973
---
THE NASTRAN THEORETICAL MANUAL/LEVEL 15/NASA SP-221(01)/APR 1972
EDITOR/R H MACNEAL
NASTRAN PRIMER LINEAR STATIC ANALYSIS/JUN 1976
H G SCHAEFFER
NASTRAN PRIMER DYNAMIC AND NONLINEAR ANALYSIS/JAN 1977
H G SCHAEFFER
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SAM-CEP
NEUTRON TRANSPORT/GAMMA-RAY TRANSPORT/MONTE CARLO/CORRELATED SAMPLING/FLUX AND DOSE DIFFERENCES/CROSS SECTION PERTURBATIONS
SAMCEP/A CORRELATED MONTE CARLO NEUTRON AND GAMMA RADIATION TRANSPORT CODE/BRL-CR-330/JAN77
H LICHTENSTEIN/H STEINBERG/J BROOKS
FORTRAN
CDC 7600 HUNTSVILLE
OPERATIONAL/EASY TO RUN
CORRELATED SAMPLING OF RADIATION TRANSPORT
RADIATION TRANSPORT

NOT APPLICABLE
MONTE CARLO
RANDOM WALK

THREE DIMENSIONAL
RECTANGULAR/CYLINDRICAL/SPHERICAL
YES
BOLTZMANN EQUATION
FLUX DIFFERENCES AS A FUNCTION OF ENERGY/TIME/POSITION

YES
NOT APPLICABLE
100
YES
NONE
NONE
EQUILIBRIUM
TIME-INDEPENDENT/TIME-DEPENDENT
NONE
EQUILIBRIUM
NONE
COMBINATORIAL GEOMETRY/PERTURBATION EFFECTS/CROSS SECTION VARIATIONS
EQUILIBRIUM TRANSPORT
W E BANKS/G J KLEM/W B BEVERLY
B
EFFECTS OF EVALUATOR ASSIGNED NITROGEN NUCLEAR CROSS SECTION UNCERTAINTIES UPON TRANSPORT OF NEUTRONS/BRL 1830/SEP 75
W B BEVERLY/A MILLER/W E BANKS
SENSITIVITY OF TRANSPORT OF 14-MEV NEUTRONS TO SHAPE OF NITROGEN ELASTIC ANGULAR DISTRIBUTION/BRL 1666/SEP 73
W B BEVERLY
CORRELATED SAMPLING MONTE CARLO NEUTRON TRANSPORT USING SAMCEP/THREE STUDIES/BRL 1633/FEB 73
W B BEVERLY/A C ENGEBRETSON
NEUTRON CROSS SECTION SENSITIVITY STUDIES FOR OXYGEN/NITROGEN/DRY AIR/BRL 1503/APR 72
W E BANKS

SAM-CE
3D/TIME-DEPENDENT/MONTE CARLO/NEUTRON AND GAMMA TRANSPORT/FORWARD AND ADJOINT/ POINT AND VOLUME DETECTORS/ENDFB XSECTNS
SAM-CE A THREE-DIMENSIONAL MONTE CARLO CODE FOR SOLUTION OF FORWARD NEUTRON/FORWARD AND ADJOINT GAMMA/DNA2830F/JUL 74
M O COHEN/H STEINBERG/E TROUBETZKOY/H LICHTENSTEIN/M BEER
FORTRAN
CDC 7600 HUNTSVILLE
OPERATIONAL/EASY TO RUN
NEUTRON/GAMMA RAY TRANSPORT

NOT APPLICABLE
MONTE CARLO
RANDOM WALK

THREE DIMENSIONAL
RECTANGULAR/CYLINDRICAL/SPHERICAL
YES
BOLTZMANN EQUATION
FLUX AS A FUNCTION OF ENERGY/TIME/POSITION

YES
NOT APPLICABLE
100
YES
NONE
NOT APPLICABLE
EQUILIBRIUM
TIME-INDEPENDENT/TIME-DEPENDENT
NONE
EQUILIBRIUM
NONE
COMBINATORIAL GEOMETRY
EQUILIBRIUM TRANSPORT
W E BANKS/G J KLEM/W B BEVERLY
1
TIME-DEPENDENT ENERGY DEPOSITION AND COMPTON ELECTRON CURRENTS/HDL-CR-76-029-1
M O COHEN/H S SCHECTER/H STEINBERG


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THUNDERBALL .
NONEQUILIBRIUM/RADIATION-HYDRODYNAMICS/ATMOSPHERIC TRANSPORT AND RESPONSE/ATOMIC IONIZATION/FIREBALL CHEMISTRY/
THE BRL NONEQUILIBRIUM NUCLEAR FIREBALL CODE/BRL DRAFT REPORT/
JOSEPH LACETERA ET.AL./CONTINUUM MECHANICS CENTER/BRL/APG MD/301 278 4353
FORTRAN
CDC 7600 HUNTSVILLE
OPERATIONAL/COMPLICATED TO RUN
FIREBALL PHENOMENOLOGY
X-RAY TRANSPORT
SPHERICAL BLAST
EULERIAN
FINITE DIFFERENCE
VARIATION OF PIC
FIRST
ONE DIMENSIONAL
SPHERICAL
YES
CONSERVATION OF MASS/MOMENTUM/ENERGY/PARTICLES
DENSITIES/VELOCITIES/GAS ENERGY/RADIATION ENERGY
PERFECT GAS LAW
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TRANSMITTIVE/MOVING
50 BY 1
MANUAL/AUTOMATIC
YES
YES
NOT APPLICABLE
  1
NOT APPLICABLE
INVISCID COMPRESSIBLE
SPECIAL TREATMENT
NONEQUILIBRIUM
TIME-DEPENDENT PHOTON ENERGY DEPOSITION
NONEQUILIBRIUM
NONEQUILIBRIUM
NONE
NONEQUILIBRIUM IONIZATION/NON-LTE
NOT ROUTINELY RUN
JOSEPH LACETERA
  1
EFFECTS OF NONEQUILIBRIUM PHENOMENA ON RADAR TRANSMISSION/BRL DRAFT REPORT
JOSEPH LACETERA/G DAUM
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SAMS
JNSTEADY/2D/EULERIAN/ONE MATERIAL/FINITE DIFFENCE/COMPRESSIBLE FLUID/MOVING BOUNDARY OF ARBITRARY GEOMETRY
A USERS MANUAL FOR SAMS BRL CONTRACT REPORT NO162 AD782 179 /JUNE1974
J L FARR/R W TRACI/SAI 101 CONTINENTAL BLDG SUITE310 EL SEGUNDO CA 90245
FORTRAN
3RLESC
OPERATIONAL/EASY TO RUN
MUZZLE BLAST CALCULATIONS
PROPANE TORCH CALCULATIONS
JET FLOW CALCULATIONS
EULERIAN
FINITE DIFFERENCE
VARIATION OF PIC
FIRST
TWO DIMENSIONAL
RECTANGULAR/CYLINDRICAL
YES
CONSERVATION OF MASS/MOMENTUM/ENERGY
DENSITY/VELOCITIES/TOTAL ENERGY
PERFECT GAS LAW
NOBLE-ABEL

REFLECTIVE/TRANSMITTIVE/FREE-SLIP/MOVING
50 BY 150
MOVE
YES
NO
NOT APPLICABLE
1
NO
INVISCID COMPRESSIBLE
ARTIFICIAL VISCOSITY
NONE
NOT APPLICABLE
NONE
NONE
MOVE
TRACER PARTICLES/EXTENSIVE GRAPHICS PACKAGE AVAILABLE
STATIC INSTABILITIES AT LATE TIMES
C K ZOLTANI/M COLEMAN
3
A NUMERICAL METHOD FOR THE SIMULATION OF MUZZLE GAS FLOWS WITH FIXED AND MOVING BOUNDARIES BRL CONTRACT REPORT 161
R W TRACI/J L FARR/C Y LIU
THE INTERMEDIATE BALLISTIC ENVIRONMENT OF THE M-16 RIFLE BRL REPORT 1860 FEB 1976
C K ZOLTANI
CALCUATION OF THE MUZZLE FLOW FIELD OF THE 155MM HOWITZER M-109 BRL REPORT 1901 AUG 1976
C K ZOLTANI

EPIC

TITLE IS NOT KNOWN EXPECTED PUBLISHING DATE IS JULY 77
S R JOHNSON/DEFENSE SYSTEMS DIV/HONEYWELL INC/MINNEAPOLIS MN
FORTRAN
UNIVAC 1108 EDGEWOOD
PILOT
KINETIC ENERGY PENETRATION
SHAPED CHARGE STUDIES
IMPACT AND WAVE PROPAGATION
LAGRANGIAN
FINITE ELEMENT

NOT APPLICABLE
TWO DIMENSIONAL
RECTANGULAR/CYLINDRICAL
YES

MIE-GRUNEISEN

REFLECTIVE/TRANSMITTIVE/NON-SLIP/FREE-SLIP/MOVING/FREE SURFACE
2000 NODES
NONE
NO
YES
YES
5
YES
VISCID COMPRESSIBLE
ARTIFICIAL VISCOSITY
NONE
NOT APPLICABLE
NONE
NONE
NONE
STRENGTH OPTION/SLIPLINES

J A ZUKAS/G H JONAS_*/B RINGERS/J J MISEY
1
ANALYSIS OF ELASTIC-PLASTIC IMPACT INVOLVING SEVERE DISTORTIONS JOURNAL APPLIED MECHANICS SEPT 1976
S R JOHNSON

EPIC-5

TO BE PUBLISHED AS BRL CONTRACT REPORT ON OR ABOUT MAY 1977
S R JOHNSON/DEFENSE SYSTEMS DIV/HONEYWELL INC/MINNEAPOLIS MN
FORTRAN
UNIVAC 1108 EDGEWOOD
PILOT
KINETIC ENERGY PENETRATION
SHAPED CHARGE STUDIES
IMPACT AND WAVE PROPAGATION
LAGRANGIAN
FINITE ELEMENT

NOT APPLICABLE
THREE DIMENSIONAL
RECTANGULAR/CYLINDRICAL/SPHERICAL
YES

MIE-GRUNEISEN

REFLECTIVE/TRANSMITTIVE/NON-SLIP/FREE-SLIP/MOVING/FREE SURFACE
USES SUBSTRUCTURE METHOD---GRID LIMITED ONLY BY TIME-COST CONSIDERATIONS
NONE
NO
YES
YES
5
YES
VISCID COMPRESSIBLE
ARTIFICIAL VISCOSITY
NONE
NOT APPLICABLE
NONE
NONE
NONE
STRENGTH OPTION/SLIPLINES

J. A ZUKAS/M S CHAWLA/G H JONUS/B RINGERS
0


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HELP
UNSTEADY/2D/EULERIAN/MULTI-MATERIAL/FINITE DIFFERENCE/INTEGRAL FORMULATION/PIC TYPE/SOLID AND FLUID APPLICATIONS
HELP A MULTI-MATERIAL EULERIAN.../VOLUMES 1-2/SSSR-75-2654 MAY71/BRLCR39 JULY75
J J HAGEMAN D E WILKINS ET.AL./SYSTEM SCIENCE AND SOFTWARE LAJOLLA CA 92038
FORTRAN
BRLESC/CDC 7600 HUNTSVILLE/UNIVAC 1108 EDGEWOOD
OPERATIONAL/EASY TO RUN
SHAPED CHARGE STUDIES
KINETIC ENERGY PENETRATION
FRAGMENTATION MUNITIONS
EULERIAN
FINITE DIFFERENCE
VARIATION OF PIC
FIRST
TWO-DIMENSIONAL
RECTANGULAR/CYLINDRICAL
YES
CONSERVATION OF MASS/MOMENTUM/ENERGY
DENSITY/VELOCITIES/TOTAL ENERGY
TILLOTSON
JWL-JONES/WILKINS/LEE
PERFECT GAS LAW
---
REFLECTIVE/TRANSMITTIVE
ON CDC 7600 60 BY 200//ON UNIVAC 1108 34 BY 86
MANUAL
NO
YES
YES
 23
YES
INVISCID COMPRESSIBLE
ARTIFICIAL VISCOSITY
NONE
TIME-DEPENDENT EXPLOSIVE DETONATION
NONE
NONE
LIMITED
STRENGTH OPTION/TRACER PARTICLES/SLIPLINES
OVER THERMALIZATION
3 JONUS/J MISEY/M CHAWLA/JANET LACETERA/JOE LACETERA/J HARRISON/J SCHMITT
 4
BRLSC AN ADVANCED EULERIAN CODE FOR PREDICTING SHAPED CHARGES VOLUME1
SYSTEMS SCIENCE AND SOFTWARE  LAJOLLA CA 92038
NUMERICAL ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF PENETRATION BY KINETIC PROJECTILES AFATL-TR-72-48
SYSTEMS SCIENCE AND SOFTWARE  LAJOLLA CA 92038
EFFECTS OF HIGH EXPLOSIVE PARAMETERS AND DEGREE OF CONFINEMENT ON JETS FROM LINED SHAPED CHARGES BRL CR 245
SYSTEMS SCIENCE AND SOFTWARE  LAJOLLA CA 92038
RESEARCH STUDY AND ANALYSIS FOR IMPROVEMENT OF SHAPED CHARGE CODE  BRLCR140
SYSTEMS SCIENCE AND SOFTWARE  LAJOLLA CA 92038
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NOVA
UNSTEADY/1D/TWO PHASE/FINITE DIFFERENCE/INVISCID COMPRESSIBLE GAS/FLAMESPREADING MOBILE BED RHEOLOGY
NUMERICAL ANALYSIS OF A TWO PHASE FLOW WITH EXPLICIT INTERNAL BOUNDARIES PGA-TR-76-2 SEPT 76
P S GOUGH PO BOX 1614 PORTSMOUTH NH
FORTRAN
UNIVAC 1108 EDGEWOOD
OPERATIONAL/EASY TO RUN
FLAMESPREADING IN GUNS

EULERIAN
FINITE DIFFERENCE
MACCORMACK
SECOND
ONE DIMENSIONAL

YES
CONSERVATION OF MASS/MOMENTUM/ENERGY
POROSITY/GAS MASS/PHASE VELOCITIES/GAS ENERGY
PERFECT GAS LAW
NOBLE-ABEL

REFLECTIVE/TRANSMITTIVE/MOVING
SO
NONE
NO
NO
NOT APPLICABLE
2
NO
INVISCID COMPRESSIBLE
SHOCK FITTING
NONE
PROPELLANT COMBUSTION
NONE
NONE
EXTENSIVE
COMBUSTION OPTION

C W NELSON/R D ANDERSON
1
COMPARISON OF THREE TWO PHASE FLOW CODES BRL MR2729 JAN77
C W NELSON

METRIC
UNSTEADY/3D/EULERIAN/MULTI-MATERIAL/FINITE DIFFERENCE/INTEGRAL FORMULATION/SOLID AND COMPRESSIBLE FLUID APPLICATIONS
DEVELOPMENT OF ORDNANCE VELOCITY MULTIMATERIAL 3D PERFORATING CODE FOR FINITE PLATES SSS R 76-2861(DRAFT) FEB 76
. J HAGEMAN/E P LEE SYSTEMS SCIENCE AND SOFTWARE LAJOLLA CA 92038
FORTRAN
UNIVAC 1108 EDGEWOOD

KINETIC ENERGY PENETRATION

EULERIAN
FINITE DIFFERENCE

FIRST
THREE DIMENSIONAL
RECTANGULAR
YES
CONSERVATION OF MASS/MOMENTUM/ENERGY

TILLOTSON

REFLECTIVE/TRANSMITTIVE
46 BY 27 BY 13
NONE

YES
YES

YES
INVISCID INCOMPRESSIBLE
ARTIFICIAL VISCOSITY
NONE
NOT APPLICABLE
NONE
NONE

STRENGTH OPTION/TRACER PARTICLES/CAN HANDLE AS MANY DIFFERENT MATERIALS AS DESIRED
CODE IS UNTRIED/GRID MUST HAVE AT LEAST 3 ROWS IN EACH DIRECTION/BOUNDARIES MUSTINITIALLY COINCIDE WITH CELL BOUNDARIES
S H JONAS/J MISEY
0


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SMITE
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SMITE-A SECOND ORDER EULERIAN CODE FOR HYDRODYNAMIC AND ELASTIC-PLASTIC PROBLEMS BRL CR REPORT 255 AUG 75
S Z HURSTEIN/H SCHECHTER/E TURKEL//MAGI INC ELMSFORD NY
FORTRAN
UNIVAC 1108 EDGEWOOD
PILOT
KINETIC ENERGY PENETRATION
SHAPED CHARGE STUDIES
---
EULERIAN
FINITE DIFFERENCE
LAX-WENDROFF
SECOND
TWO DIMENSIONAL
RECTANGULAR/CYLINDRICAL
YES
CONSERVATION OF MASS/MOMENTUM/ENERGY
---
TILLOTSON
MIE-GRUNEISEN
---
---
REFLECTIVE/MOVING/FREE SURFACE
100 BY 30
MOVE
NO
YES
YES
  5
YES
INVISCID COMPRESSIBLE
ARTIFICIAL VISCOSITY
NONE
NOT APPLICABLE
NONE
NONE
NONE
STRENGTH OPTION
---
J A ZUKAS
  3
BRL CONTRACT REPORT NO 294
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BRL CONTRACT REPORT NO 295
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BRL CONTRACT REPORT NO 175
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DORF
SOLVES INVISCID EULER EQUATION FOR FLUID FLOW
THE DORF CODE USERS MANUAL/AFWL-TR-70-60/JUL 70
D N PAYTON
FORTRAN
BRLESC/UNIVAC 1108 EDGEWOOD
OPERATIONAL/EASY TO RUN
AIRBLAST LOADING ON TARGETS
HIGH VELOCITY IMPACT
SHAPED CHARGE STUDIES
EULERIAN
FINITE DIFFERENCE
PARTICLE-IN-CELL/CENTER DIFFERENCING
---
TWO DIMENSIONAL
RECTANGULAR/CYLINDRICAL
NO
CONSERVATION OF MASS/MOMENTUM/ENERGY
---
TILLOTSON
PERFECT GAS LAW
---
---
REFLECTIVE/TRANSMITTIVE
50 BY 80
NONE
---
YES
YES
  9
YES
INVISCID COMPRESSIBLE
ARTIFICIAL VISCOSITY
NONE
NOT APPLICABLE
NONE
NONE
EXTENSIVE
STRENGTH OPTION/TRACER PARTICLES
---
F H GREGORY/R LOTTERO/V KUCHER/J HARRISON
  1
CODE CORRELATION STUDY/AFWL-TR-70-144/APR 71
W E JOHNSON
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REPSIL
LARGE TRANSIENT RESPONSE/ELASTOPLASTIC/STRAIN HARDENING/STRAIN RATE DEPENDENT/KIRCHOFF SHELLS/DYNAMIC LOADING
A USERS MANUAL FOR THE REPSIL CODE/BRL R 1744/OCT 74
J M SANTIAGO/H L WISNIEWSKI/N J HUFFINGTON JR/BALLISTIC RES LAB
FORTRAN
BRLESC
OPERATIONAL/EASY TO RUN
TRANSIENT DEFORMATION OF SHELLS
---
---
LAGRANGIAN
FINITE DIFFERENCE
EXPLICIT TIME DIFFERENCE
SECOND
THREE DIMENSIONAL
SPECIAL TREATMENT
YES
CONSERVATION OF MASS/MOMENTUM
ENERGY
---
---
---
---
CLAMPED/HINGED/SYMMETRY
30 BY 30
NONE
NO
YES
YES
  1
NOT APPLICABLE
NONE
NOT APPLICABLE
NONE
NONE
NONE
NONE
EXTENSIVE
STRENGTH OPTION/TRACER PARTICLES/GENERAL SHELL/2D SHELL/3D SPACE
REPSIL IS NOT A HYDRO CODE
J M SANTIAGO/H L WISNIEWSKI/N J HUFFINGTON JR/J D WORTMAN
  4
THEORY LARGE DEFLECTION ELASTOPLASTIC STRAIN HARDENING SHELL RESPONSE/BRL R1571
J M SANTIAGO
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N J HUFFINGTON JR/J D WORTMAN
PARAMETRIC INFLUENCES ON RESPONSE OF STRUCTURAL SHELLS/BRL R 1689
N J HUFFINGTON JR/J D WORTMAN
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RIPPLE
UNSTEADY/2D/EULERIAN/ONE MATERIAL/FINITE DIFFERENCE/INVISCID COMPRESSIBE FLOW
RIPPLE-A 2D UNSTEADY EULERIAN HYDRODYNAMIC CODE-USERS MANUAL BRL REPORT1632 FEB 73
C W NELSON
FORTRAN
BRLESC/UNIVAC 1108 EDGEWOOD
OPERATIONAL/EASY TO RUN
BLAST WAVES
---
---
EULERIAN
FINITE DIFFERENCE
FLUID IN CELL
---
2D DIMENSIONAL
RECTANGULAR/CYLINDRICAL
YES
CONSERVATION OF MASS/MOMENTUM/ENERGY
DENSITY/VELOCITIES/INTERNAL ENERGY
TILLOTSON
PERFECT GAS LAW
---
---
REFLECTIVE/TRANSMITTIVE
50 BY 50
DONE
NO
YES
NO
  1
NO
INVISCID COMPRESSIBLE
ARTIFICIAL VISCOSITY
NONE
TIME-DEPENDENT
NONE
NONE
LIMITED
---
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C W NELSON
  1
NUMERICAL CALCULATIONS OF FLOW FROM RECOILLESS RIFLE NOZZLES BRL REPORT 1688
C W NELSON
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